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Wireless LANs

Modulation Selection Criteria for Higher Data Rate FH

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Author: Nathan Silberman

21513 Conradia Court
Cupertino, CA 95014
Phone: 408/ 253-5066
Fax:
e-Mail:nsilberman@mcimail.com

Abstract

The following is a collection of criteria suggested in the PHY group meetings and comments from Cupertino meeting on 8/23/1993. At this time no benchmark environments had been defined. Explanations to these criteria are in italic letters. The list is open for additions and deletions.

Criteria for the selection of the modulation technique for Higher Data Rate Frequency Hopping PHY:

1. Compatibility with 802.11 PAR
   It means 1 Mbps or higher data rate.
2. Technical feasibility: *Hardware complexity , Non linear Amplification(?)*
3. Economic feasibility: *i.e cost of implementation in production.*
4. Suitable for portable applications
   power consumption, size, power down/ sleep modes, peak current, heat dissipation
5. Flexibility for technological growth
6. Compatibility with ISM environment
   ISM environment is characterized by interference; there are several types of interference to be considered: similar networks (overlapping networks), dissimilar networks (using other SS transmission techniques), other users in the band, narrow band signals (such as microwave ovens), partial band such as other part 15.xxx users, other ISM devices and Amateur radio.
7. Ability to coexist with opposite PHY
   It should be covered under 6 above
8. Meets regulatory technical requirements
   Meets the in-band and out-of-band spectral requirements demanded by various agencies in different countries (FCC requires 20 dB bandwidth at channel edges-1 MHz bandwidth-, using the "conservative interpretation).
9. Minimum data rate
   Per Cupertino meeting (Aug. 23,. 1993) straw vote it should be equal or higher than 1.5 Mbps.

10. Bandwidth efficiency (at maximum data rate) concordant to no. 8
11. Impact on radio
    The modulation should not preclude low cost implementations while it is highly desirable to allow for improved performance implementations (which might be more expensive).
12. Impact on throughput *e.g. ACI performance, preamble etc.*
13. Operation with overlapping networks
    These are similar networks utilizing different hopping sequences. These networks create a certain degree of interference.
14. Robustness of transmission technique
    Operation in interference, multipath propagation and other channel impairments. Recommend to provide quantification such as : Probability of Acquisition, tracking, MSDU loss rate.
15. BER vs. Eb/No in benchmark environment
    Benchmark environment not defined yet.
16. Lending itself for error correction codulation.
17. Ability to operate in a Frequency hopping environment.
    Frequency Hopping is characterized by discontinuity at hop time. The length of time for this discontinuity is determined by the hardware time to complete the frequency change and have the radio parts ready for operation. This is a reason why coherent modulations are less suitable for FH without increased hardware complexity.
18. Ability to acquire vs. S/I.
    a. in environments of its own.
    b. in environments of opposite PHY.
    c. in presence of ISM interference.
19. BER vs. S/I
    a. in environments of its own.
    b. in presence of opposite PHY.
    c. in presence of ISM interference.
20. Impulse noise response.
21. Suitable for Integration (ASIC) implementation (preferably digital).
22. No impact or minimum impact on MAC.
23. Compatible with basic data rate modulation (GFSK) *i.e. ability to operate in dual mode and communicate with GFSK only devices.*
24. Peak field strength vs. Max. transmitted power.
25. Net throughput with short packets:- *Preamble, - Equalization.*
26. Sensitivity to phase impairments (phase "flips", phase noise, etc.).
27. Sensitivity to frequency tolerance and frequency deviation tolerance *(VCOs characteristics, coefficients of crystals, etc.).*
28. Acquisition time.
29. Use QPSK as baseline BER / Bandwidth efficiency comparison.
30. Data file successful transfer time as function of bit rate, available Eb/No, C/I and coverage area.
31. Interoperability requirements from MAC and air medium for higer data rate gear shift with 1 Mbps GFSK (Data rate switching scheme).